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European Patent Office  
Office européen des brevets

(11) Publication number:

0 237 192  
A2

(12)

## EUROPEAN PATENT APPLICATION

(21) Application number: 87301168.8

(61) Int. Cl.<sup>3</sup>: B 29 C 65/16

(22) Date of filing: 11.02.87

(30) Priority: 20.02.86 NO 860643

(43) Date of publication of application:  
16.09.87 Bulletin 87/38

(84) Designated Contracting States:  
AT BE CH DE ES FR GB GR IT LI NL SE

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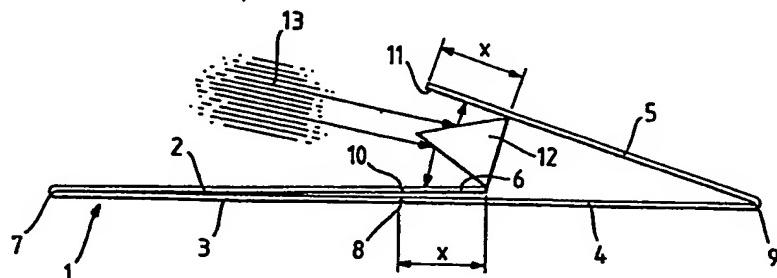
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(54) A method and a device for welding together plastic or plastic covered surfaces.

(57) A method and a device for welding together plastic or plastic covered surfaces (6, 11) by the aid of laser beam heating (13), especially for joining the lateral seam of a container or a blank for a container. Between the plane areas (11, 6) to be melted together a reflector means (12) is provided with surfaces having a reflecting angle orthogonal

to the faces to be melted together (6, 11). The laser beam (13) is emitted while the surfaces (6, 11) to be melted together are directed past reflector means (12) in its longitudinal direction. The faces (6, 11) are pressed and melted together after having left the area at said reflector means (12). Said reflector means (12) is, e.g. a reflecting prism.



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A method and a device for welding together plastic or  
plastic covered surfaces.

The invention relates to a method and a device for welding together plastic or plastic covered surfaces by the aid of laser beam heating.

Containers intended for liquid comestibles, e.g. airy produce, beverages, or juice, are conventionally manufactured from thermoplastic covered cardboard, but they may also be manufactured entirely from cardboard. Such containers are manufactured of a plane blank provided with folding indications in the shape of embossed lines, and said blank is commonly folded into a rectangular tube shaped body which is closed in a suitable manner at its top and bottom. In assembling the blank to a tube shaped body by use of only one starting blank a flap is joined with a side edge area on a side surface, and it is of great importance to achieve a completely tight seal. The conventional manner of carrying out such joining or sealing is by the aid of glue or by heating to make the plastic surfaces melt together.

If a seam without any leakage is to be granted it is, however, difficult to carry out this technique rapidly and efficiently on a production line. A difficulty arising in this connection is that both surfaces to be mutually contacted should be quite uniformly heated in order to obtain a uniform joining. This also being a case of opposed surfaces it may be necessary to keep said surfaces at a relatively large mutual distance to be able to exert the necessary influence of heat to achieve the desired heating. There will then be a hazard of cooling said surfaces in an uncontrolled manner before they are joined.

It is an object of the present invention to provide a method and a device permitting two plastic or plastic covered surfaces to be welded together without encountering the above

mentioned disadvantages and by which entirely constant heating of both opposite surfaces is achieved.

This object is achieved by use of a heating device in the shape of a laser, and the invention is characterized by the 5 features appearing from the claims.

In European Patent Application 0147833 use of laser beams for melting or plasticising two seam surfaces to be welded is disclosed. A device is disclosed by the aid of which a laser beam is split permitting simultaneous heating of two 10 surface areas by the same beam. In another embodiment two surfaces to be welded together are provided at a mutual angle, and the laser beam is made to radiate into said angle heating and plasticising said surfaces so that they can melt together. This last mentioned method which is 15 especially suited for surfaces containing a metal film in their composition will cause reflections between said lateral surfaces extending in a mutually inclined manner resulting in unequal heating and uncertainty as regards the final tightness of the seam. With the present invention 20 this problem is avoided by use of the reflecting means ensuring that only an exactly defined surface area is heated, and whereby both surfaces will also be equally heated to ensure the best possible result. Also, a lower energy laser beam may be used. In the same manner as in the above mentioned 25 European application an unfocused laser beam is used.

Said reflection means is provided in the longitudinal direction of said seam surfaces and the latter are introduced with a surface on each side of said reflector means, and are moved across said reflector means and are then compressed to 30 a tight union after having passed said reflector means.

Further features of the invention will appear from the following description of an embodiment diagrammatically shown in the drawing and in a side elevation illustrating the principle of laser beam heating via a reflector means of two

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surface to be melted together.

The drawing shows an end elevation of a blank for a thermo-plastic covered container that is to be joined along one side face. The cardboard container may be covered by a 5 thermoplastic, e.g. polyethylene, on its outside faces and may, if desired, also comprise a metal film, e.g. an aluminum film. In a first assembling step of the container the blank, designated 1 in the figure, is folded to make two and two side faces mate. The desired rectangular container has 10 four side faces 2, 3, 4, and 5. Additionally, said blank is provided with a side flap 6 which is to form the seam-connection with the end portion of side face 5. The side wall portions of the container are separated by grooved or embossed lines 7, 8, 9, and 10. At the phase of manufacture 15 shown in the drawing said cardboard blank is folded at embossed lines 7 and 9, so that faces 2 and 3 mate, whereas faces 4 and 5 enclose an acute angle. The container blank may either have the form of separate blanks for each container, supplied one after the other, or in the shape of a web 20 intended for being cut transversally, before bottom and top portions are joined. Such a process of manufacture of containers is commonly known technology.

In order to achieve welding of the side edge areas said container blank is conveyed in the position as shown in the 25 figure in a lateral direction, i.e. transversal to the paper plane, over a reflector means 12, the container blank 1 being provided in such a relation to reflector means 12 that said means 12 will limit the two surfaces to be welded together, i.e. the interior face area 11 of surface 5 and seam flap 6 30 both having a length indicated by x in the figure. To heat said faces a laser beam 13 is emitted into reflector means 12 which in the shown embodiment is a reflector prism that is symmetrically arranged, so that the laser beam is reflected equally to both sides towards the faces to be melted

together. This occurs continuously at the same time as blank  
1 is conveyed on in a lateral direction. By the aid of a  
correct section of the intensity of said laser beam in relat-  
ion to the length of reflector prism 12 plasticisation or  
5 melting of said two side faces is achieved, which faces can  
be pressed together in a known manner after having left the  
area of said reflector prism to form a homogeneous and good  
melted connection or weld.

Because of the high intensity of said laser beam heating will  
10 be very quick so that the process of melting together can be  
carried out on a working path feeding blanks 1 at comparativ-  
ely high speed.

It should be mentioned that reflector means 12 does not have  
to be a prism, but can be designed in a desired manner the  
15 only consideration being that said laser beam must be equally  
divided between both faces to be plasticized. Necessary  
adjustments will be obvious to those skilled in the art.

CLAIMS:

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1. A method for welding together plastic or plastic covered surfaces by the aid of laser beam heating, especially for joining the lateral seam on a container,  
characterized in that a reflector means  
5 with faces having an angle of reflection that is orthogonal to the faces to be melted together is provided between the surface areas to be melted together, that said laser beam is emitted while the faces to be melted together are directed past said reflector means in its longitudinal direction,  
10 and that said faces are pressed together and melted together after having left the area of said reflector means.

2. A method as defined in claim 1,  
characterized in that the faces to be welded together are held to enclose an acute angle while being  
15 directed past said reflector means, and that the reflector means and the faces to be melted together are held in such a mutual relationship that said reflector means will limit the area that is to be heated for welding together.

3. A device for welding together plastic or plastic covered surfaces by the aid of laser beam heating, especially for melting together the longitudinal lateral seam of a blank for a tube shaped container body,  
characterized in a laser beam emitter, by the fact that in the radiation area of said emitter a reflector means is provided and that a conveyor means is provided  
25 for said container blank holding said blank with each of the two faces to be welded together at one side of said reflector means, respectively, limited by its end edges and symmetrical relative to said reflector means, and that said conveyor is designed for conveying the blank across said reflector means.  
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4. A device as defined in claim 3,  
characterized in that said reflector means is a reflecting prism.

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